

**SCIENCE INTEREST FOR STATE SECRETARIES MEETING AUGUST 24, 2017
STATES AND EPA REGIONAL OFFICES**

STATE SCIENCE INTERESTS

INTEREST: Health risks in the Anacostia and Potomac Rivers

DETAILS: Water quality criteria, pathogens, and potential health risks in the Anacostia and Potomac Rivers - The District's waters are impaired by bacteria, which often creates a health hazard for swimming and other water recreation. However, even with this concern, there is interest in expanding recreational opportunities on the rivers. With the implementation of the Long Term Control Plan well underway, it is a good time to conduct a swimming and sanitary survey that would investigate the public health risks and swimming potential of the Potomac and Anacostia Rivers.

SCIENCE NEED: The water quality criteria and pathogens could be intensively studied, as well as alternative analytical methods and modeling. The study could ultimately provide frequent data to the public to make informed decisions regarding the whether the District's waters are safe for recreation.

INTEREST: Dewatering into District of Columbia's Municipal Separate Storm Sewer System (MS4)

DETAILS: There is a need to better understand impact of potential dewatering into the District of Columbia's MS4. This information would be useful for the development and revision of our regulatory approach to dewatering.

SCIENCE NEED: The water quality criteria and pathogens could be intensively studied, as well as alternative analytical methods and modeling. The study could ultimately provide frequent data to the public to make informed decisions regarding the whether the District's waters are safe for recreation. Possible studies including:

- Whole Effluent Toxicity Testing of dewatering discharge from several sites to understand if the suite of pollutants present in excess of Water Quality Standards (WQS) is actually harmful. This would be useful because there are situations where technology does not exist to achieve WQS for certain pollutants. It would be worth discussing the sampling alternatives. For example, conducting tests with dry-weather discharge from outfalls may be most meaningful in reflecting actual water quality of discharge from multiple sites at the point it enters a waterbody, but alternatively, the tests could be done with discharge from particular sites before it enters the MS4.
- Study of extent to which contaminated groundwater in District waterbodies is flowing into waterbodies naturally. I recognize that this varies from site to site, but some

characterization of this from a set of reasonably representative sites could be helpful.

- Study of extent to which dewatered groundwater is diluted as it flows through MS4 to an outfall. I recognize that this varies from site to site, but some characterization of this from a set of reasonably representative sewersheds could be helpful.
- Study of extent and speed at which mixing in receiving waters may render contaminated discharge not harmful.

INTEREST: Monitoring study of the stormwater impact of rooftop agriculture relative to traditional green roofs.

SCIENCE NEED: Research into inputs including nutrients and pesticides, irrigation impact on retention, planting and harvesting methods, and crop types.

INTEREST: Impact on stormwater retention of solar arrays on green roofs.

SCIENCE NEED: Monitoring study of impact on stormwater retention of solar arrays mounted above green roofs.

REGIONAL SCIENCE INTERESTS

INTEREST: Legionella in DW large distribution& premise plumbing systems

DETAILS: Hospitals and hotels nationwide are opting to augment their incoming public drinking water with additional chemicals/disinfectants dosed on-site. While drinking water quality entering these buildings is adequately controlled by the public water utility, localized challenges within building plumbing are not well understood. This can result in increased opportunity for the growth of pathogens, including Legionella, thereby creating a public health risk. For example, a recent outbreak within Region 3 of hospital-acquired pneumonia from Legionnaire's disease caused multiple fatalities despite having additional copper-silver ionization disinfection treatment in the hospital's internal drinking water distribution system.

SCIENCE NEED: Guidance is needed for monitoring/control of such complications, yet drinking water from public water systems entering large buildings undergoes (bio)chemical reactions that can significantly deteriorate its quality and foster an environment for Legionella and other infections pathogens to flourish.

INTEREST: Perfluorinated Compounds (PFCs) of Concern

DETAILS: Lack of health-related information on many PFCs (other than PFOS and PFOA)

found in the environment and no applicable health goals for compounds known to be present in public and private water supplies and in surface waters.

Science Need: Health values or guidance for waters that receive contaminated waste water or for public and private drinking water supplies is desperately needed by state agencies who have the responsibility to protect their public, but do not have the resources to generate defensible values. States have requested EPA's support in developing drinking water health advisories and NPDES discharge limits for PFCs or a nationally consistent procedure for states to follow in calculating these limits on a case-by-case basis.

INTEREST: Nutrient linkage to Human Cancer Risk

DETAILS: Higher levels of TOC in treated drinking water as a result of excess algae growth from anthropogenic nutrient sources can result in higher levels of DBPs. This dynamic in treated drinking water poses a cancer risk that is not well understood.

SCIENCE NEED: EPA/states need research to show if there is a direct linkage between excess nutrients and cancer risk posed from chlorinated drinking water. This information would then justify higher expenditures for efforts to reduce nutrients in surface waters used by public water systems as a source of drinking water.

INTEREST: Mines Pools

DETAILS: Thousands of abandoned mines in PA & WV house millions of gallons of contaminated water that must be pumped and treated to prevent breakouts and discharges to rivers and streams in the region. Significant vulnerabilities for these discharges exist as the responsible companies declare bankruptcy and cease pumping operations and as these waters work their way through the abandoned mine walls by subsidence and erosion. Some of these breakouts have already occurred and others continue to seep contaminated water to receiving streams.

SCIENCE NEED: Inventories and maps have been done for some mine pools but none is comprehensive in terms of 3-D mapping, assessing connections among and between mine pools, water quality of the pools, geology and risks of breakouts of mine pools, flooding potential and impacts downstream, and potential extent of adverse impacts to receiving watersheds should breakouts occur.

INTEREST: Harmful Algal Blooms

DETAILS: Streams and rivers, including large rivers such as the Ohio River, have suffered from harmful algal blooms (HABs), which are colonies of algae in aquatic habitats that grow out of control to the point of producing toxic and harmful effects on water quality, fish and wildlife, and sometimes cases humans. HABs can also adversely affect fishing and tourism, and thus a

region's economy.

SCIENCE NEED: Research is needed to better understand how and why these blooms form, and to improve detection and forecasting of these seasonal events.

INTEREST: Environmental DNA (eDNA)

DETAILS: No reliable remote sampling method exists to determine the presence of Threatened and Endangered species (T&E) of freshwater shellfish such as mussels in streams or rivers. Consequently, regulatory decisions involving Total Maximum Daily Loads as they related to T&E species may not include a complete assessment of potential impacts to these species.

SCIENCE NEED: Preliminary investigative work on the use of eDNA to establish presence/absence of T&E fish and freshwater mussels is in its early stages but has great promise to be a cost effective tool for the assessment and biological monitoring of aquatic ecosystems. A more comprehensive and concerted effort is needed to fully research this method to determine its efficacy in reliably identifying the presence or absence of aquatic T&E species.

INTEREST: Ecosystem Services

DETAILS: The benefits people receive from ecosystems are often difficult to quantify and even more difficult to monetize. as a consequence, benefit/cost assessments and decisions often do not include quantified or monetized ecosystem benefits. Typically, ecosystem considerations in benefit/cost decisions include only quantities such as areal extent (e.g., acres) only ecosystem quality assessments.

SCIENCE NEED: Reliable methods are needed to quantify and monetize ecosystem services across all the major ecoregions.

INTEREST: Source & Effects Endocrine Disrupting Compounds of Fish Populations

DETAILS: Some commercially important freshwater fisheries in the region are suffering from deformities and poor juvenile recruitment. a key example is the smallmouth bass population in the Susquehanna River, where such deformities and reduced juvenile recruitment are suspected to be caused by endocrine disruptors, a group of chemicals that are both suspected or known to affect human as well as fish and wildlife hormones. They may also interfere or block the way natural hormones and their receptors are made or controlled. endocrine disruptors include dioxins, PCBs, DDT, and other pesticides.

SCIENCE NEED: Research is needed to identify cause and effect relationships that result in such adverse impacts to ecologically and commercially important fisheries.

INTEREST: Sustainable Development Performance Metrics

DETAILS: Measuring and modeling environmental/human health impacts of EPA's sustainable development work is needed to better gage the impact of the financial and technical investments we make through our community support efforts.

SCIENCE NEED: ORD SHC national research program already engaged in some individual research efforts but more universal methodology or indices that could be used more broadly would benefit the agency.

INTEREST: Mid-Atlantic Ocean Action Plan

DETAILS: The interagency Mid-Atlantic Regional Ocean Council (MARCO) is working to develop and implement the Mid-Atlantic Ocean Action Plan in concert with the Mid-Atlantic Governors' Agreement on Ocean Conservation. One of the key INTERESTs is the need for robust and comprehensive data on which to base recommendations and decisions to enhance and sustain the long-term health of the Mid-Atlantic's Ocean resources.

SCIENCE NEED: Data are needed to fill biological and geological information gaps, including data regarding biological surveys, changing food web dynamics, increasing acidity of the ocean, changing ocean circulation patterns, rising sea levels, and shifts in the distribution of fish stocks as species move northward and/or offshore in response to oceanic changes. Also necessary are assessments of changes in ocean uses such as changes in ship traffic patterns and increased ship size, major changes to harbor infrastructure, including deepening of channels and raising bridges to accommodate the larger ships, increased interest in offshore sand mining, development of offshore wind farms, potential exploration for oil and gas deposits in portions of the Mid-Atlantic, placement of telecommunications and energy transmission infrastructure, and more recreational use of the ocean.

INTEREST: Regional Monitoring Networks

DETAILS: Some efforts are underway to establish Regional Monitoring Networks (RMNs) to determine changing baselines in streams and watershed across the eastern US. This effort, however, is only a preliminary step and requires significantly more investment. Other similar efforts, such as that for wetlands, has yet to be initiated.

SCIENCE NEED: The science needs here are to establish baseline data across a vast network of streams to measure and compile data on such abiotic parameters as water temperature, hydrologic regime, groundwater, water quality, ice cover, freeze/thaw, habitat, and materials cycling; and biotic factors such as growth, metabolism, morphology, demographic rates, reproductive cycles, evolutionary, adaptation, phenology, selection, community composition, abundance and food web.

INTEREST: Emergent pollutants

DETAILS: PFOA/PFAS discussion should be expanded to include some its pre-cursors/by-products/derivatives such GenX.

INTEREST: CDC Blood-lead levels

DETAILS: Impact to clean-up programs

SCIENCE NEED: The lead discussion should include a discussion of recent changes to acceptable levels of blood-lead levels Interested by CDC and the impact of this change on our clean-up programs.

INTEREST: New obligations in TSCA21 program

DETAILS: The TSCA21 program creates new obligations for facilities and EPA to evaluate the safety of existing chemicals. the role of state and local partners in this technical review process is developing and has considerable uncertainty.

SCIENCE NEED: Establish what role, if any, ORD would play in the Agency's required review of these existing chemicals. If ORD does have a role, they may have insight into how or if State/Local partners will have a role in the process.

INTEREST: Consistent characterization of vapor intrusion (VI) remedies

DETAILS: VI investigation and assessment is sometimes extremely mutable given seasonal variations with data and the fluctuation in measurements (usually lower, as with TCE). OSCs can exercise a lot of discretion with VI, which is especially challenging in dealing with PRPs. Given that the solution is almost always in-home vapor mitigation systems, at least in the near-term, considerable time and financial resources are expended checking, re-checking, verifying and re-verifying the presence or (especially) absence of VOCs in a house.

SCIENCE NEED: A simpler, cheaper and predictable set of parameters that would help move projects to the mitigation stage for both Fund-lead and enforcement cases. A presumptive remedy would provide a shortcut to mitigation, provided that parameters are established (e.g., groundwater plume within a certain distance – horizontally and vertically – of homes, certain concentrations in the groundwater and/or soil gas, etc.), and would some of the variability out of the process for VI investigations and mitigation.

INTEREST: Per and Polyfluoroalkyl Substances (PFAS)

DETAILS: Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) are two of the most common PFAS found in the environment and in the human body. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body. Several states in the northeast, including those in Region 3, have sites where drinking water is impacted by PFAS.

INTEREST: Urban Contamination with Lead

DETAILS: There is evidence of widespread lead contamination of soil in urban areas. Soil lead concentrations in urban areas are often found to be above risk based screening levels. A wide variety of sources (lead paint, leaded gasoline, incinerators, coal combustion and industrial operations) may have contributed to the contamination. What can be done to identify and distinguish between the sources responsible and reduce exposure to lead? In addition, the increasing popularity of urban gardening has raised concerns about the potential for lead exposure when gardening in lead-contaminated soils.

SCIENCE NEED: There is a need to determine the extent of background lead contamination and its contribution to both indoor and outdoor exposures. Where soil contamination exists above levels of concern we need to develop low cost and effective means of immobilizing the lead so it is not tracked indoors, taken up by edible plants, or re-entrained. Additionally, better methods for distinguishing sources of lead from one and other would help focus remediation efforts

INTEREST: Emissions monitoring

DETAILS: Title V permitting requirements of the Clean Air Act include that compliance with emissions limits is ensured at all times. However, stack testing and continuous monitoring may be expensive or impractical at times. Parametric monitoring is often used between direct emissions measurements in an effort to indicate compliance with the limits in an economical way. However, it is often difficult to determine the efficacy of the various parametric monitoring strategies and parameters.

SCIENCE NEED: Information is needed to determine the likelihood that emissions limits will be exceeded using different parametric monitoring strategies. Additionally, tools providing comparisons of different parametric monitoring strategies will enable more effective application of monitoring strategies.

INTEREST: Metals including lead and associated metals mining

INTEREST: DNAPL source areas and associated long-term groundwater contamination (also includes vapor intrusion)

INTEREST: NEED: Cost/Benefit analysis on In Situ Thermal technologies

INTEREST: Impacts on long term groundwater remediation. What impact does ISTT have on duration of groundwater remediation?

INTEREST: Remediation approaches for river systems and watersheds (mainly focused on mining impacts)

INTEREST: Landfills and associated subsurface reactions

INTEREST: Prescribed burning of the unique Tallgrass ecosystem of the Flint Hills Region of Kansas and Oklahoma

DETAILS: The springtime prescribed burning of the unique Tallgrass ecosystem of the Flint Hills Region of Kansas and Oklahoma has the potential to cause air quality INTERESTs in areas downwind

SCIENCE NEED: Ongoing and future research is important to understand and address air quality concerns from the prescribed burns. This would include the improvement of accuracy estimates of acres burns, fuel type and load that is specific to the region, meteorology, and the potential of changing long-time burn behaviors (e.g., spreading out the burn season, patch - burning, fall burning, etc.).

INTEREST: PFOAs/PFAS

SCIENCE NEED: Need action levels for corrective action sites.

INTEREST: UST Corrosion

DETAILS: INTERESTs associated with the storage of ethanol and low sulfur diesel fuels in UST systems; submersible turbine sump corrosion for USTs storing ethanol-blended fuels; vapor-space corrosion of metal components inside fiberglass and steel USTs storing low sulfur diesel fuels; comparable vapor-space corrosion may also occur with USTs storing ethanol-blended fuels.

INTEREST: Pesticide Drift (DiCamba)

INTEREST: Harmful algal blooms and nutrients

INTEREST: Drinking Water Contaminants forming in consecutive systems when not present in wholesale systems. Disinfectant by-products is one example.

INTEREST: Blood lead levels less than 10 µg/dL.

DETAILS: Health effects associated with blood lead levels less than 10 µg/dL.

SCIENCE NEED: Research is needed to determine whether decreasing lead exposure in land cleanup programs under current policy recommendations meaningfully translates to decreased blood lead concentrations in exposed individuals. To our knowledge, this information has been shared with ORD.

INTEREST: Toxicity of PFAS

DETAILS: Information on the toxicity of many per- and polyfluoroalkylated substances (PFAS) - is lacking, and analytical methods for PFAS in ground, surface, and wastewater as well as soils, sediments and biosolids are in various stages of development.

SCIENCE NEED: Need appropriate analytical methods and information on toxicity of PFAS found in the environment to determine whether compounds of concern are present, and whether actions to protect public health and the environment are needed. This information has been shared with ORD, and collaborative efforts are ongoing.

INTEREST: Atmospheric deposition of nitrogen in Rocky Mountain National Park.

DETAILS: Mechanisms contributing to atmospheric deposition of nitrogen - There is limited understanding of mechanisms contributing to atmospheric deposition of nitrogen (e.g., from intense front-range agricultural operations) affecting air, water, soil, and biological resources in Rocky Mountain National Park.

SCIENCE NEED: A better understanding of mechanisms is critical to identify the most effective strategies for reducing nitrogen deposition in Rocky Mountain National Park. This information has been shared with ORD, and there are some collaborative efforts underway.

INTEREST: VOC and NO_x emissions from oil and gas operations

SCIENCE NEED: In order to determine if mitigation actions are required (and what actions are appropriate), a better characterization of emissions and sources is needed. This information has been shared with ORD, and there are some collaborative efforts underway.

INTEREST: Understanding Harmful Algal Blooms

DETAILS: We see to understanding the following: increased air temperature relationship to water temperature; water temperature increases to change in development of HABs (volume/unit time); change in efficiency to produce cyanotoxins; human toxicity of cyanotoxi

SCIENCE NEED: Need to understand to what extent will expected changes to the condition of

surface waters from warming water temperatures make treatment needed to comply with drinking water standards more complex and costly or result in lower compliance rates? This is a research need with ongoing work involving Regions 1,2,6,7 and 8 and listed on the OW/ORD research tracker.

INTEREST: Wildfire effects on drinking water, management, eco-services

DETAILS: Wildfire effects on drinking water, management, eco-services - questions exist around the short and long-term effects of wildfire on drinking water quality, quantity, availability, and treatability

SCIENCE NEED: Research need on short and long-term effects of wildfire on drinking water quality, quantity, availability, and treatability; relative costs, benefits, and effectiveness of pre- and post-forest management approaches to reducing the risk of wildfire or mitigating effects on drinking water quality and quantity; effects of wildfire on drinking water treatment processes; effects of wildfire on groundwater-based drinking water supplies; methods of pricing ecosystem services provided by forests and other ecosystems for drinking water protection; long-term (10 yrs+) effects of wildfire on drinking water supplies; information on watershed resiliency to wildfire across various geographies, ecosystems, and climatic regions.

INTEREST: Risk of nodularin toxin for primary contact recreation

DETAILS: Evaluate risk of nodularin toxin for primary contact recreation use exposure under the Clean Water Act.

SCIENCE NEED: Need to work with OW's Office of Science and Technology to establish protective thresholds for this cyanotoxin. This information is necessary for evaluating the effect of high levels in Great Salt Lake on recreational users; likely also applicable in marine and coastal waters. This is a new research need shared by R8 through an update of the OW/ORD research tracker. Work has not started.

INTEREST: Beneficial reuse of produced water

SCIENCE NEED: In order to consider the appropriate beneficial reuse options for produced water, more information on produced water constituents, concentrations, and toxicity is required. To our knowledge, this information has not been shared with ORD.

INTEREST: Buffer setbacks for surface waters

DETAILS: Adequate buffer setbacks to protect surface waters from industrial activities.

SCIENCE NEED: Research is needed to inform adequate buffer setbacks to protect surface

waters from industrial activities (e.g., oil and gas development). Without this information, there is a lack of scientific basis to recommend the appropriate setback width. In the fall of 2015, this need was shared with ORD but there are currently no ongoing collaborative efforts of which we are aware.

INTEREST: Wildfires

SCIENCE NEED: Technology to monitoring emissions from wildfires to help prevent smoke exposure and evaluate exceptional events for NAAQS compliance

INTEREST: Near Roadway Air Quality

SCIENCE NEED: Technologies for measuring and addressing near-roadway air pollution

INTEREST: Water Reuse

SCIENCE NEED: Appropriate technologies for gray/black water treatment and reuse

INTEREST: Mercury and Arsenic

SCIENCE NEED: Treatment technologies mercury and arsenic from mine sites in soil and surface waters.

INTEREST: Microplastic

DETAILS: Microplastic contamination in soil and water

INTEREST: PFOA/PFAS – Drinking water and Superfund sites

INTEREST: Nutrients – Algal blooms

SCIENCE NEED: Technologies for removing microcystin from drinking water, CAFOs, nitrates in ground water, and nitrogen contributing to air pollution pre-cursors

INTEREST: Lead – Drinking water and lead-based paint

Aug. 8, 2017

Contaminated Sediments and Surface Waters at Superfund Sites

Description of Issue and Importance to Region 2: A large number of water bodies lie within the boundaries of Region 2, ranging from the Hudson River to the Great Lakes. Some of the region's RCRA and Superfund sites impact these surface waters, e.g., the Hudson River, Passaic River, Raritan Bay, and Onondaga Lake, to name just a few.

Science Needs Associated with the Issue: Issues of particular interest in the region are discussed below.

Remediation of Contaminated Sediments: At sites where contaminated sediments impact surface waters, the most commonly used remedies to date have included actions such as dredging or sediment capping. Region 2's ability to effectively remediate contaminated sediments would benefit from the commercial availability of in-situ treatment options, or off-site innovative treatment technologies that would enable alternative disposal or beneficial use applications. Region 2, in partnership with its State and Local partners, has been a leader in the testing, development and demonstration of emerging and innovative technologies for the treatment of contaminated sediment. In the past 15 years nearly 20 technologies have been tested and full-scale demonstrations have taken place for three technologies, including sediment washing and thermo-chemical treatment. Data from these commercial-scale demonstrations suggest sediment treatment technologies are viable in removal efficiencies and economics, yet implementation remains a problem, in part due to long-term sediment stream requirements. While implementation challenges are being addressed, decision support tools are also needed to identify the most environmentally protective and sustainable solutions, including the consideration of carbon footprints, cost, energy use, "pollution", and the overall environmental impact of the various treatment solutions.

Background Studies to Identify Default Concentrations of Dioxins, PCBs and Arsenic: Toxicity information for many chemicals, and these three in particular, are under review. It is possible that updated toxicological profiles would result in concentrations at regulatory limits below what are likely to be background concentrations. Current EPA guidance suggests that sites are not remediated below background levels. Therefore, background concentrations in Region 2 states are critical when assessing the need for remediation and understanding the levels to which remediation would occur. Having background concentrations, whether natural or anthropogenic, for specific chemicals at specific areas throughout Region 2 is necessary to implement programs such as RCRA, TSCA, and CERCLA. Research is needed to identify background concentrations of specific chemicals, and determine the most appropriate way to identify background concentrations (i.e., state-wide, county-wide, based on geologic formation). This can be accomplished through a literature review to identify current data and data gaps, and develop sampling plans to fill the data gaps. In addition, a database of concentrations would be helpful to organize the background data.

State and Region-Specific Surveys of Fish and Crab Ingestion Rates: Ingestion of fish that bioaccumulate contaminants is a key factor in evaluating the risk to public health at these sites, and developing remediation goals. Current EPA guidance on fish ingestion does not include default fish ingestion rates; rather, the guidance recommends collecting site-specific information. This effort is very resource intensive, and if implemented for each site, would likely delay the investigation and remediation. It is recommended that Region 2 compile available studies for subregions or watersheds to identify appropriate ingestion rates for populations in Region 2. For areas that do not have appropriate studies, R2 should develop and implement a regional fish ingestions survey to identify appropriate ingestion rates for the populations in Region 2.

Contamination in Fractured Rock

Description of Issue and Importance to Region 2: Proper site characterization is critical in developing accurate conceptual site models and in achieving restoration at all contaminated sites. Contaminated fractured rock sites pose a special challenge given the high cost of remedial investigations in rock and a lack of understanding of the processes that control fate and transport in these complex environments. This is a priority due to the large number of contaminated rock sites that exist in the region and the lack of cost effective investigation techniques and effective remedial technologies.

Science Needs Associated with the Issue:

Fate and transport of contaminants in fractured rock systems:

- The mechanisms by which contaminants both diffuse in and out of porous rock matrices,
- The fate of certain contaminants within rock matrices. For example, to what degree do contaminants adsorb onto the rock matrix and do biodegradation, abiotic degradation and chemical transformation play a role in reducing contaminant concentrations within rock matrices in certain rock types, and
- Properties that affect back diffusion so that back diffusion rates can be more accurately predicted which will allow practitioners to determine if matrix diffusion will limit remediation effectiveness.

Remediation technologies that are effective in addressing contaminants that have diffused into rock matrices. Thermal technologies, for example, show great promise, however, there are limited field demonstrations at Superfund sites.

Contaminant mass flux: Additional applications are needed to evaluate groundwater velocity and contaminant mass flux in complex fractured rock environments. Having a better understanding for how contaminant mass moves in the fractures will help us evaluate more realistic cleanup timeframes and better assess appropriate remediation technologies.

Development of Innovative Site Characterization and Treatment Technologies

for Contaminated Sites

Description of Issue and Importance to Region 2: With continued budgetary constraints, the challenges in accurately assessing and achieving timely restoration and site reuse beneficial to communities at complex contaminated sites in Region 2 are increasing. Advances in faster, cheaper and more sustainable ways to assess and cleanup contamination are needed.

Science Needs Associated with the Issue: Issues of particular interest in the region are discussed below.

Efficient, Cost-Effective Sampling Approaches: A potential method to reduce costs could be the development and use of more efficient sampling approaches at contaminated sites. A number of tools could be used to save on laboratory costs. For example, gaining confidence in handheld, real-time monitors could aid in decreasing the volume of laboratory samples necessary to make a decision and/or for monitoring. Additionally, exploring tools and approaches such as those used in high resolution site characterization, multi-incremental sampling, and EPIC aerial survey searches could result in more precise sample locations and potentially fewer analytical samples; thus, lower cost to the respective programs. There is a need for the testing of various handheld and other innovative field tools to determine their precision when compared with traditional analytical samples. There is also a need to understand and integrate alternative sampling methodologies at Superfund (and RCRA) sites, including new indoor air vapor intrusion (VI) sampling technologies given the high number of VI sites in the Region.

Emerging Contaminants: Chemicals are being discovered in soil, groundwater and surface waters at Superfund sites that previously had not been detected or are being detected at levels that may be significantly different than expected. These are often generally referred to as “contaminants of emerging concern” (CECs) because the risk to human health and the environment associated with their presence, frequency of occurrence, or source may not be known. CECs of interest in Region 2 include pharmaceuticals and personal care products (PPCPs) and those commonly found at federal facility sites in the region such as 1,4-dioxane, and munitions related CECs [i.e., 2,4,6-trinitrotoluene (TNT), dinitrotoluene (DNT), perchlorate]. While work is being done to improve the understanding of a number of CECs that are often found at Superfund and RCRA sites, research gaps exist in detection and quantification, environmental fate and transport, health and risk assessment, and remediation for CECs. Addressing these gaps is important in developing effective assessment and cleanup strategies. Additional training and guidance for Region 2 staff as new technologies are developed are also needed.

Thermal Remediation: Thermal remediation technologies have shown to be effective in reducing high levels of volatile and semi-volatile organics in the subsurface much quicker than other technologies. However, due to the high energy costs associated with this technology many practitioners are reluctant to choose it as a remedy. There is a need to provide tools to analyze its life cycle benefits and understand the performance of different thermal applications in both unconsolidated and fractured rock aquifers.

Contaminant Degradation Due to Natural Attenuation: An understanding of natural degradation processes, both those attributed to microbial activity and non-biological (abiotic) activity is important when determining effective remedial strategies at contaminated sites. For

example, "large-dilute plumes" of chlorinated solvents have recently been targeted as an issue in the Superfund program, with many in Region 2. These plumes demonstrate biogeochemical conditions that result in slow contaminant degradation and that allow plume expansion, as well as matrix diffusion that results in secondary sources which extends remediation timeframes. A full understanding of the natural degradation mechanisms and rates at such sites will aid in developing strategies to sustainably and cost-effectively enhance degradation rates, potentially mitigating the requirement for an engineered remedy throughout the entire plume. Work in further developing tools that are able to provide direct measurements of organisms, genes or enzymes involved in contaminant biodegradation; of the relative contributions of abiotic and biotic processes; and of the relative rates of various degradation processes, are needed.

Additional training and guidance for Region 2 staff as new tools are developed are also needed.

Per- and Polyfluoroalkyl Substances (PFAS)

Description of Issue and Importance to Region 2: Per- and polyfluoroalkyl substances (PFASs) are a class of chemicals that have been used in numerous consumer and industrial processes due to their oil and water resistant properties and their exceptional stability. They have been widely used in carpet and fabric protection, in food packaging, and in metal plating, and have been included in products with familiar trade names, including Teflon, Gore-Tex, Stainmaster, and Scotchguard. In addition, PFAS are key components of aqueous film-forming foams (AFFF), which are used for firefighting.

Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) are two of the most common PFAS found in the environment and in the human body. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body. Several states in the northeast, including those in Region 2, have sites where drinking water is impacted by PFAS.

Science Needs Associated with this Issue: There is a need to improve understanding of 1) the formation, fate and transport and formation of PFASs in the environment; 2) the characterization of inhalation and dermal exposure pathways; 3) the toxicity of these compounds; and to develop effective remediation technologies, in order to fulfill EPA's mission to protect human health and the environment.

Data Mining/Management

Description of Issue and Importance to Region 2: Region 2 collects large amounts of data in various formats and uses multiple national databases for storage (e.g. EQuIS for Superfund, STORET/Water Quality Exchange for the Water Program, ICIS, etc.). Although a division may rely on a particular database for storage, these databases do not require uniform procedures for data entry (metadata, quality assurance) or data storage. Therefore, access by other EPA program staff, governmental agencies, and the public is limited. In addition, nationally developed and managed databases may not allow for the manipulation of data to serve Regional needs, such as targeting, coordination, etc. Although several recent Presidential Memorandums - Managing Government Records, Building 21st Century Digital Government, and Roadmap for Digital Government – are moving the government towards more transparent data management (storage, sharing), large amounts of staff time are still spent responding to FOIAs and other data/information requests. In addition, a great deal of staff time is spent creating and maintaining individual databases to meet their decision needs. Developing uniform procedures, formats, and shared platform (with public access) would save extensive staff time typically

spent searching for relevant data, downloading or inputting data into individual systems, and processing data to meet their regional programmatic needs.

Science Needs Associated with this Issue: Need to identify specific pilots (example groundwater, which could coordinate CWD, DECA, and ERRD data) that would: identify critical data elements and compare the metadata standards that their national databases use; determine the feasibility of standardizing critical metadata elements (locational information, elevation and depth, lab results, etc.); outline the key use and needs for the data (decisions, targeting, reporting, etc.); and propose tools for improving the region's ability to find, use, communicate, and disseminate data. Provide cross-divisional database learning opportunities in the form of trainings and workshops. This will enhance the skill sets of those already familiar with the databases and provide accessibility to staff who may only have limited database exposure. With a wider network of staff who understand the intricacies of the multiple databases used by EPA, reaching a more uniform data management system will be possible. If the region is to work effectively on the complex issues facing it, the region will need to share data across regulatory frameworks and the web.

Urban Contamination with Lead

Description of Issue and Importance to Region 2: There is evidence of widespread lead contamination of soil in urban areas. Soil lead concentrations in urban areas are often found to be above risk based screening levels. A wide variety of sources (lead paint, leaded gasoline, incinerators, coal combustion and industrial operations) may have contributed to the contamination. Urban lead programs have focused on reducing exposure to lead paint in multi-family dwellings. NYC DOHMH has analyzed the incidence of elevated blood lead levels and estimates that 1/3 of the cases reported to them are due to exposures in 1 and 2 family homes and that 25-33% of all cases of elevated blood lead are not associated with peeling or deteriorated lead paint. In 2008 approximately 1900 children in NYC alone had elevated levels of blood lead. What can be done to identify and distinguish between the sources responsible and reduce exposure to lead? In addition, the increasing popularity of urban gardening has raised concerns about the potential for lead exposure when gardening in lead-contaminated soils.

Science Needs Associated with this Issue: There is a need to determine the extent of background lead contamination and its contribution to both indoor and outdoor exposures. Where soil contamination exists above levels of concern we need to develop low cost and effective means of immobilizing the lead so it is not tracked indoors, taken up by edible plants, or reentrained. Additionally, better methods for distinguishing sources of lead from one and other would help focus remediation efforts.

Citizen Science

Description of Issue and Importance to Region 2: Citizens have a great interest in and can be positive contributors to environmental protection and the health of their communities. While Region 2 has a long history of working with citizens, community groups and volunteers, and has many on-going projects, it continues to seek opportunities to increase its community engagement, utilize citizen-collected data, and provide assistance to communities interested in collecting environmental information.

Science Needs Associated with this Issue: Citizen Scientists can benefit from low-cost, highly portable sensors that can produce data of known quality. The Region needs to work, on behalf of these

communities, with ORD, OAQPS, and the Agency's innovative technology teams to promote the development and piloting of low-cost, hand-held and smartphone sensors within its communities. In addition, communities need assistance in understanding, managing, and using environmental information and would benefit from the development of data sharing and display technologies and tools that can be used to inform community decisions.

Inventory and Valuation of Natural Ecosystem Services

Description of Issue and Importance to Region 2: Region 2 believes that inventory and valuation of natural ecosystem services is a powerful tool to help in prioritizing protection and restoration of these services, and to adequately finance them. Integration of economic analyses with water program planning can empower improved decision-making, demonstrate values of natural resources with comprehensible numbers, and help define and pursue financing and leveraging options for bolstering those resources. Water program managers are often faced with assessing ecosystem trade-offs in deciding between options: weighing the ecosystem services advantages/disadvantages in increasing habitat quality/use in contaminated environments (e.g., restoring Spartina marsh in Hackensack watershed); or substituting one type of habitat for another (e.g., losing shallow water habitat while creating emergent wetlands). In addition, water program managers are often faced with insufficient information to fully quantify and convey the loss of ecosystem services from realized or proposed/potential detrimental impacts.

Another important need is to incorporate the economic valuation of natural systems and features into the Hurricane Sandy long-term recovery efforts. Substantial federal funding has been awarded to New York and New Jersey to address resiliency in light of Hurricane Sandy. Region 2 is actively engaged with communities involved in the development of long term recovery plans that will hopefully include climate change adaptation considerations and resiliency planning. Targeted economic valuations of natural ecosystem services would be valuable for communities as they begin to prioritize, build public support for, and finance the inclusion of natural ecosystem enhancements into their land use planning decisions and other coastal resiliency efforts.

Science Needs Associated with this Issue: Regional managers require tools and methodologies to allow for identification of key ecosystem services provided by natural systems and features. Furthermore, the tools and methodologies should provide guidance on how to best place economic values on natural ecosystem services to allow for informed decisions to be made and to impress upon decision makers that additional investment toward enhancing ecological services is also economically justifiable. In the energy sector, for example, natural gas wells, pipelines, and associated right-of-ways in forested areas can fragment these natural systems for the pipeline's lifetime. Tools and methodologies to determine the economic value or natural ecosystem services associated with forests (e.g., carbon sequestration, or habitat value) can better inform the location of wells and pipelines, ideally in a systematic, possibly regional way. Finally, there is also a need to understand how to include the financial benefits of ecosystem services into the more traditional cost benefit analysis tools and the newer scenario planning tools that are already being used in resiliency planning. Better, and more integrated tools, are required for decision making at both project and system-wide scales.

Caribbean Science Related Issues

Description of Issues and Importance to Region 2: A number of diverse issues that impact the health of Region 2's Caribbean territories include: declining coral health; insufficient childhood screening for lead contamination; exposure to unexploded ordnance on and around the Island of Vieques; the lack of sufficiently treated source waters in small, remote communities; inadequately closed landfills; and, compared to the US mainland, greater risks of asthma and a greater likelihood of preterm births.

Arsenic and Other Toxic Metals in Puerto Rico: Data on background concentrations, whether natural or anthropogenic, for specific chemicals at specific areas throughout Region 2 is necessary to implement programs such as RCRA and CERCLA. Most soils in PR have concentrations of arsenic and other toxic metals in concentrations well above regulatory limits. These high concentrations are the result of local geology (e.g. volcanic rocks, residual limestone), tropical soil chemistry (e.g. lower pH), and past agricultural activities. However, there is no database on concentrations of arsenic and other toxic metals in soils throughout the island. The need to identify background concentrations of specific chemicals, and determine the most appropriate way to identify background concentrations (i.e., state-wide, county-wide, based on geologic formation). This can be accomplished through a literature review to identify existing data and data gaps; the development of sampling plans to fill the data gaps; and the creation of a GIS database to organize background data. In addition, background data collected needs to be systematically available in a centralized location known to regional personnel. Where background data are available, users are frequently unaware of it. Consequently the investment in the data collection and the usability is compromised. This is a high priority that should be remedied.

Unexploded Ordnance on and around Vieques, PR: Technologies are needed that can be used for the identification and removal of unexploded ordnance. There is also a need to better understand the rate of munitions constituents release from the underwater munitions, the dissolution kinetics of the materials released from them and the potential impacts to ecosystem. In addition, there is a need for technology that can be employed to identify underwater live munitions and minimize the impact to the surrounding marine ecosystem during its removal.

Coral Reef Health: Coral reef ecosystems are ecological assets, providing habitat for diverse and abundant marine species, primary production and trophic complexity. There are also social and cultural values attributed to coral reefs, especially in island communities like the US Virgin Islands and Puerto Rico. Yet, coral reefs are declining worldwide with factors such as warming sea temperatures, decreasing pH levels, human disturbance, resource extraction and water quality degradation threatening the sustainability of these ecosystems and their services. Caribbean coral systems account for less than ten percent of the corals in the world, yet these systems account for two-thirds of the reported diseased corals. Of immediate concern are the increasing instances of disease, exacerbated by coral bleaching, decreasing pH levels, and elevated nutrient and sediment levels. Some of the science-related needs associated with the preservation and restoration of our coral communities include: the identification of specific water quality stressors responsible for impairments; the development of appropriate watershed- or receiving water-specific numeric endpoints that can support the identification of water quality stressors and inform water quality management programs, e.g., TMDL development, NPDES permit limits, and nonpoint source controls; and, the impact of ocean acidification on the biological, chemical and physical integrity of marine waters and coral reef communities.

Other issues presently lacking accompanying text:

Harmful Algal Blooms

The Relationship Between Poverty and Surface Water Quality in New York City and San Juan, PR